



## Stone City Provides a Variety of Finishes For Stampings and Assemblies

### GOLD PLATING

Gold electro-plating is most commonly used in electronic applications where strong electrical conductivity is needed. Typically it is plated on top of copper and nickel finishes eliminating tarnishing and corroding the finish. Because of the high cost of gold, it is often selectively plated; meaning that only the specific areas where electrical conductivity is needed is gold plated, remaining areas are not. Gold finishing for ornamental purposes is referred to as gilding.

Additionally, firm pricing for gold plating is not provided due to the volatility in the gold market. The cost of the finishing component for the part is determined on the base price for the gold (i.e. \$400.00 per ounce) and the difference between the base price and the market price is based on a gold surcharge. Gold-plated parts include a gold surcharge which is subject to change each time the parts are run.

### SILVER PLATING

Silver electro-plating is generally used for less demanding electronic applications. It is often used as a more economical substitute for gold. Silver is a more effective conductor of electricity than gold, however since it does oxidize (reducing conductivity), gold is better for electrical contacts. Care should be used when selecting silver plating for parts exposed to high humidity environments where a condition called red plague can occur. Silver plating can also be used for decorative objects and cutlery. Silver surcharges, similar to those on gold, are common on this type of plating.

### CHROME PLATING

Chrome plating is the electro-deposition of chromium over a thin underlying layer of nickel plating or a mix of copper and nickel plating. The most common form of chrome plating is decorative bright chrome. Bright chrome imparts a mirror-like finish to parts such as metal furniture frames, bumpers and automotive trim. Chrome plating provides excellent corrosion resistance. Heavier deposits of chrome plating are called hard chrome and are used in industrial equipment to reduce friction and wear.

### ZINC PLATING

Zinc electro-plating is the most common finish on stamped metal parts and assemblies. The zinc coating prevents oxidation (such as rust on steel) of the protected metal by forming a barrier and acting as a sacrificial anode if the barrier is damaged. In addition to the zinc plating, an additional chromate coating is usually added on top of the zinc plating as a sealant for added corrosion protection. The most common chromate is clear in order for the dull silver color of the zinc to be visible. Black chromate is also available which provides additional protection over the clear chromate. Black chromate is highly variable in color and appearance, so it is not appropriate if consistency in the appearance of the part is vital.

Zinc plating is done on either a barrel or a rack plating line. In the barrel plating line, parts are placed in a rotating plastic barrel which processes through the plating line. Since a variety of parts may be in the same barrel, it is possible for plating imperfections to occur as parts settle together which prevent the plating solution or the chromate to completely cover the part. These defects represent a minimal percentage of the total amount of parts being plated, but do occur. If it is necessary to eliminate these plating defects, a 100% visual sorting operation is done at an additional cost to the customer. Another method of eliminating defects is to load the parts on a custom rack (where they are not touching) and then run through a rack plating line. Delicate parts are generally run on a rack plating line in order to eliminate damage that may occur due to the rotating barrel. Rack plating is more expensive due to the individual handling of the parts as they are loaded and unloaded to and from the rack.

Zinc plating provides excellent corrosion protection; however zinc oxide (a fine white dust) may form on the part as the zinc coating sacrifices itself to protect the base metal. Typical zinc plated parts are hardware, internal automotive and appliance parts. If you are plating spring steels, it is important the parts are baked immediately after plating in order to remove any hydrogen embrittlement that may have been rendered by the zinc plating process. Zinc electro-plating is typically the least expensive post finishing process.

## **MECHANICAL ZINC PLATING**

In mechanical zinc plating, a protective layer is adhered to the parts by tumbling small zinc flakes with the stamped parts. On occasion, small plastic beads are added to the tumbling process to aid in the peening of the zinc flakes onto the part's surface. An advantage to this technique is that this is not an electrolytic process along with the hydrogen-embrittlement of heat treated parts is completely avoided. A disadvantage is that there is not a metallurgical bond between the zinc and the part's surface which means that flaking can occur over time. This process does not work well for parts over 4 inches (100mm) in size and is more expensive than electro-zinc plating.

## **TIN PLATING**

Electro-tin plating is used extensively to protect both ferrous and nonferrous parts. Tin is also a very useful metal for the food processing industry since it is non-toxic, ductile and corrosion resistant. When procured as pre-plated sheet material, the excellent ductility of tin allows sheet metal to be formed into a variety of shapes without damage to the tin layer. Tin provides a sacrificial protection for nonferrous metals, excluding steel. Tin is also widely used in the electronic industry because of its ability to protect the base metal from oxidation, thus preserving its solderability.

## **CADMIUM PLATING**

Cadmium-electro plating offers several advantages such as excellent corrosion resistance, softness and malleability, galvanic compatibility with aluminum, good lubricity and solderability, and can be dyed to many colors as well as clear. Due to the environmental toxicity of cadmium metal, its use has been greatly reduced in recent years. It is typically used exclusively for aerospace and military applications; however both industries are currently working to eliminate it entirely from their specifications.

## **DACROMET®**

Dacromet® is a water-based, inorganic metal coating that is sometimes used in place of electro-plating finishes and is also an environmental process and coating. Dacromet® provides excellent

corrosion resistance, is resistant to solvents, can conduct electricity and is hydrogen embrittlement free. The process commonly involves placing parts in a wire basket, dipping the parts in Dacromet®, spinning to reduce excess coating, and finally baking the coating. This process is usually done twice to ensure that the entire surface of the part is coated. Dacromet® is silver-grey in color and inconsistent in appearance from part to part; it is not suitable for parts that are cosmetically critical. It is used extensively in the fastener and automotive industries for parts that are not exposed and require high corrosion protection.

## **E-COATING**

E-Coating is a process used to deposit paint or a lacquer coating onto parts as opposed to metal which is deposited by electroplating. Parts are attached to racks which are then dipped into the paint or lacquer and electrified which draws the coating onto the part's surface. The parts are then baked to cure the paint or lacquer.

E-coat has very good corrosion resistance. While other colors are available 95%+ of E-coat production is black. E-coat is excellent for coating threaded parts as it provides an even coating thickness which minimizes the problem of build-up on threads. E-coat was developed originally as a paint primer and not as a finish coating. While it is often used as a finish coat, it should be remembered that E-coat is really a primer and will not yield consistent class A finishes (as E-Coat is a class B finish). E-coat also has a fairly soft finish and is prone to scratching. If you need a cosmetic finish with E-coat it will most likely require an additional operation to touch-up any scratches and requires an additional cost. E-coat does not have good elasticity, so parts should not be bent after coating.

## **POWDER PAINT**

Powder coat paint can be applied to both steel and aluminum after the application of a phosphate coating which improves the bonding of the powder coat to the base material. The powder paint (similar to the consistency of talc) is sprayed on the part. Because the powder particles are electrostatically charged the powder will attach to the parts which are then placed in an oven to melt and fuse the powder paint into a durable coating. The resulting finish is relatively hard, abrasion resistant, tough and provides excellent corrosion resistance. The choice of colors is practically limitless and applications include automotive, furniture, marine, and construction.

## **GALVANIZED STEEL**

Hot dip galvanizing is the process of applying a zinc coating to fabricated iron or steel material through immersing the material in a bath consisting primarily of molten zinc. This process is somewhat similar to zinc electro-plating except that the zinc is not electro-deposited. Galvanizing can be done pre or post fabrication. In pre-fabrication, steel coils are processed through galvanizing lines at the steel mill, providing a uniformly thick coating on the steel coil. The coated coil can then be fabricated into parts that do not require additional coating operations. In post-fabrication coating, fabricated parts are immersed in a vat of liquid zinc (highway side barrier guards are an example of this process.) Galvanizing is available only in the silver-grey color of zinc. Galvanized steel can be found in almost every major application and industry where iron or mild steel is used. The coating weight of zinc will determine corrosion resistance; however very good resistance can be achieved. Parts made from galvanized steel coil provide the most cost effective protective coating.

## ALUMINIZED STEEL

Aluminizing is a similar process to galvanizing except the coating is an aluminum-silicon alloy instead of zinc. Aluminized steel provides better corrosion resistance and is more heat tolerant than zinc. Because of this, property can be used in heat exchangers, mufflers, ovens, water heaters, fireplaces and baking pans. It is a more expensive coating than galvanizing and is only available in coated coil form.

## ANODIZING

Anodizing is an electrolytic passivation process used to increase the thickness of the natural oxide layer (aluminum oxide) on the surface of aluminum parts. Anodizing increases corrosion resistance and surface hardness as well as improves lubricity and adhesion. The anodized surface may be dyed to virtually any color though color matching from lot to lot may be difficult. Threaded holes that are anodized may require re-tapping which is an added operation and added expense. Anodized aluminum is non-conductive. Applications for anodizing include automotive, aerospace, cookware, cameras, window frames and sporting goods.